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LT-5 reissue

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR REISSUE  
OF U.S. PATENT 4,823,070

Date of Issue : April 18, 1989  
Inventor : Carl T. Nelson  
Title : SWITCHING VOLTAGE REGULATOR CIRCUIT  
Assignee : Linear Technology Corporation

New York, New York  
April 8, 1991

Commissioner of Patents  
and Trademarks  
Washington, D.C. 20231

ORDER FOR TITLE REPORT

Sir:

Please prepare and file a title report in connection with the application for reissue of United States Patent 4,823,070 filed simultaneously herewith.

A check in the amount of \$30.00 in payment of the search is enclosed.

The Commissioner is hereby authorized to charge payment of any additional fees required under 37 C.F.R. § 1.16 in connection with the paper(s) transmitted herewith, or credit any overpayment of same, to Deposit Account No. 06-1075. A duplicate copy of this Order is enclosed.

Respectfully submitted,

Mark D. Rowland  
Registration No. 32,077  
Attorney For Applicant  
c/o Fish & Neave  
875 Third Avenue  
New York, New York 10022  
Tel.: (212) 715-0600



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Assignee : Linear Technology Corporation

ASSENT OF ASSIGNEE

Commissioner of Patents  
and Trademarks  
Washington, D.C. 20231

Dear Sir:

Linear Technology Corporation, a corporation  
organized under the laws of the State of California and the  
assignee of all right, title and interest in and to the  
above-identified United States Letters Patent No. 4,823,070,  
hereby assents to the accompanying application for reissue  
of said U.S. Letters Patent No. 4,823,070.

Signed in Milpitas, in the County of Santa Clara  
and State of California this 5 day of April 1991.

LINEAR TECHNOLOGY CORPORATION  
1630 McCarthy Boulevard  
Milpitas, California 95035

By: 

Robert C. Dobkin  
Vice President, Engineering



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OFFER TO SURRENDER

Sir:

In accordance with 37 C.F.R. § 1.178, surrender of original United States Patent 4,823,070 is hereby offered. The original Letters Patent will be surrendered to the United States Patent and Trademark Office before this application for reissue is allowed.

Filed herewith is an order for a title report.

Respectfully submitted,

Mark D. Rowland  
Registration No. 32,077  
Attorney for Applicant  
c/o Fish & Neave  
875 Third Avenue  
New York, New York 10022  
Tel.: (212) 715-0600



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Inventor : Carl T. Nelson  
Title : SWITCHING VOLTAGE REGULATOR  
CIRCUIT  
Assignee : Linear Technology Corporation

New York, New York  
April 8, 1991

Commissioner of Patents  
and Trademarks  
Washington, D.C. 20231

REQUEST FOR TRANSFER OF DRAWINGS

Sir:

In accordance with 37 C.F.R. § 1.174, reissue applicant requests transfer of the drawings from the file of application Serial No. 82,989, filed August 3, 1987, now U.S. Letters Patent No. 4,823,070 entitled "Switching Voltage Regulator Circuit," to the accompanying application for for reissue of Letters Patent No. 4,823,070 upon allowance and issuance of said accompanying reissue application. A copy of this Request is enclosed for the file of the original patent.

Respectfully submitted,

Mark D. Rowland  
Registration No. 32,077  
Attorney for Applicant  
c/o Fish & Neave  
875 Third Avenue  
New York, New York 10022  
Tel.: (212) 715-0600

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LT-5 reissue

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR REISSUE  
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Assignee : Linear Technology Corporation

New York, New York 10022  
April 8, 1991

Commissioner of Patents  
and Trademarks  
Washington, D.C. 20231

LETTER OF TRANSMITTAL

Sir:

Submitted herewith for filing is an application  
for reissue of United States Patent 4,823,070 issued April  
18, 1989. The application consists of the following papers,  
all of which are enclosed:

1. The specification and 84 claims;
2. Eight sheets of informal drawings;
3. Reissue Declaration and Power of Attorney;
4. Order for Title Report (in duplicate) (along  
with a check in the amount of \$30.00 in payment of the  
Title Report fee);
5. Offer Under 37 C.F.R. §1.178 To Surrender  
Original U.S. Letters Patent No. 4,823,070;
6. Assent of Assignee;
7. Request Under 37 C.F.R. §1.174 for Transfer  
of Drawings to Reissue Application (in duplicate); and
8. A check in the amount of \$750.00 in  
payment of the filing fee.

#### Newly cited References

10. Data Sheet, "Lambda Switching Regulators, LSH6325P 2 Amp DC-To-DC Microconverter," Lambda Semiconductors Databook, Vol. I, 1988, pp. 21-24
11. Data Sheet, "Lambda Switching Regulators, LSH6335P 3 Amp DC-To-DC Microconverter," Lambda Semiconductors Databook, Vol. I, 1988, pp. 25-28
12. Data Sheet, "Lambda Switching Regulators, LSH6355P 5 Amp DC-To-DC Microconverter," Lambda Semiconductors Databook, Vol. I, 1988, pp. 29-32
13. 1984 Lambda Semiconductor Catalog, "Power Semiconductors To Simplify Switching Power Supply Design," pp. 5-13
14. Data Sheet, Unitrode Regulating Pulse Width Modulators, UC1524/UC2524/UC3524, 1/82
15. Data Sheet, Unitrode Regulating Pulse Width Modulators, UC1525A/UC2525A/UC3525A/UC1527A/UC2527A/UC3527A, 2/86 Rev.
16. Data Sheet, Unitrode Regulating Pulse Width Monitor, UC1526/UC2526/UC3526, 2/86 Rev. A
17. Data Sheet, Unitrode Current Mode PWM Controller, UC1842/3/4/5, UC2842/3/4/5, UC3842/3/4/5, 2/86 Rev. A
18. Data Sheet, Motorola MC34063/MC35063/MC33063 DC-TO-DC Converter Control Circuit, Motorola Linear/Switchmode Voltage Regulator Handbook, 1989, pp. 461-466
19. Data Sheet, Motorola  $\mu$ A78S40 Universal Switching Regulator Subsystem, Motorola Linear/Switchmode Voltage Regulator Handbook, 1989, pp. 614-619
20. Data Sheet, SGS-Thomson High Current Switching Regulators L296/L296P, September 1988
21. Silicon General 1986 Product Catalog, pp. 1-111
22. Siemens IC's For Industrial Electronics Data Book 1983/84, pp. 265-323

A copy of each of the above documents, which are listed on the accompanying Form(s) PTO-1449 (modified), is enclosed herewith. Pursuant to MPEP Section 609, applicant respectfully requests that a copy of Form(s) PTO-1449 (modified), as considered and initialled by the Examiner, be returned to the undersigned with the next communication.

It is respectfully requested that the foregoing documents be (1) fully considered by the Patent and

Trademark Office during examination of this application, and (2) printed on any patent which may issue on this application.

Applicant expressly reserves the right to establish, pursuant to 37 C.F.R. § 1.131 or otherwise, that any one or more of the above listed documents are not prior art to this application.

#### Discussion Of The Cited References

##### References of Record in '070 Patent

###### Items 1-6

Items 1-6 listed above generally relate to switching voltage regulator circuits. These patents were made of record by the Examiner during prosecution of the applications underlying applicant's '070 patent.<sup>1</sup>

More particularly, the McConnell and Priegnitz patents were cited (but not discussed) by the Examiner in connection with a May 11, 1987 Notice Of Allowability issued with respect to applicant's '158 application. That application was abandoned by applicant in favor of the '989 application.

The Bahler et al. and Easter patents were cited by the Examiner in support of an obviousness rejection (made in an Examiner's Action dated March 11, 1988) concerning claims of applicant's '989 application. The rejected claims were directed to a switching voltage regulator operable in a normal feedback mode and an isolated flyback mode. Applicant traversed the Examiner's rejection in a response filed August 10, 1988.

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<sup>1</sup> The '070 patent issued on application Serial No. 07/082,989 filed August 3, 1987, which was a continuation of application Serial No. 06/932,158 filed November 18, 1986.

The Rao and Mostyn et al. patents were cited and discussed by the Examiner in the March 11, 1988 Examiner's Action as being pertinent to applicant's disclosure.

For the Examiner's convenience, copies of the March 11, 1988 Examiner's Action and applicant's August 10, 1988 response are submitted herewith.

Items 7-9

Items 7-9 are documents that were made of record by applicant during prosecution of the '070 patent.\*\* Items 7 and 8 are data sheets regarding commercially available integrated circuit products for use in implementing switching voltage regulator circuits. Item 9 includes documents relating to the Linear Technology Corporation LT-1070 integrated circuit, which incorporates applicant's invention. Applicant discusses these items individually below.

Lambda LSH 6300 Data Sheet (item 7)

As can be seen from item 7, the Lambda LSH 6300 product family includes various integrated circuit DC-to-DC microconverters. Applicant submits herewith exemplary data sheets (items 10-12) for the five-pin package version of representative members of the Lambda LSH 6300 product family. These individual data sheets contain block diagrams that illustrate the circuitry of these products. As can be seen from the block diagrams, a sense resistor is included in the products to provide a voltage signal to a current limit sense (CLS) amplifier to provide internal current limit protection. However, these products are not current-mode switching regulators. The duty cycle of the switching

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\*\* Items 7-9 were made of record and discussed in an Information Disclosure Statement dated July 31, 1987. A copy of the July 31, 1987 Information Disclosure Statement accompanies this paper, and is incorporated herein by reference.



regulator is controlled by monitoring output voltage, not switch current.

Unitrode UC 1846 Data Sheet (item 8)

The Unitrode UC1846 data sheet includes various diagrams illustrating the connection of external circuitry to some of the 16 pins of the UC 1846 integrated circuit. For example, on page 3-114 of the data sheet, a diagram labeled "Single Ended Boost Configuration" is shown. As shown in this diagram, pins 6 ("INV") and 7 ("COMP") are used respectively to receive a feedback signal and to connect the integrated circuit to a frequency compensation network, pins 3 ("(-)SENSE") and 4 ("(+)SENSE") are used to connect an external current sense resistor, and pin 14 ("B OUT") is connected to an external switching transistor. Pins 12 ("V<sub>IN</sub>"), 13 ("V<sub>C</sub>") and 15 ("GND") are described in the data sheet as supply voltage, collector supply voltage and ground pins, respectively.

Linear Technology Corporation LT-1070 (Item 9)

As stated by applicant in his Reissue Declaration And Power Of Attorney, filed April 10, 1990 in support of the present reissue application, the LT-1070 is a five-terminal current-mode switching voltage regulator circuit designed by the applicant. As is further stated therein, the LT-1070 incorporates in the five-terminal package a power switching transistor, duty cycle control circuitry, error signal circuitry, comparator circuitry and a current sense resistor -- a feat not accomplished by any prior art current mode switching voltage regulator integrated circuit product known to the applicant.

Newly Cited References

Items 10-22

Applicant hereby makes of record further examples

of data sheets for integrated circuit products that applicant believes may have been commercially available for use in implementing linear and switching voltage regulator circuits prior to the November 18, 1986 filing date of applicant's '158 application.

Items 10-12 are discussed above in connection with item 7.

Item 13 includes data sheets for additional Lambda voltage-mode integrated circuit products having 8 or more pins. The data sheets show that the integrated circuits include a current limit sense resistor and a current limit sense amplifier.

Items 14-17 are data sheets for Unitrode integrated circuit products having 16 pins and using voltage-mode regulation.

Items 18-19 are data sheets for Motorola integrated circuit products having 8 (item 18) or 16 (item 19) pins and using voltage-mode regulation.

Item 20 is a data sheet for an SGS-Thomson integrated circuit product family having 15 pins and using voltage-mode regulation.

Item 21 is a portion of a databook including data sheets regarding various Silicon General integrated circuit voltage regulators (pp. 16-78) and integrated circuit pulse width modulators for implementing switching regulator circuits and other circuits (pp. 79-110). Included among the data sheets for integrated circuit pulse width modulators is a data sheet entitled "SG1846 .... Current Mode PWM Controller" (pp. 102-105). The block diagram shown in this data sheet is similar to that of the Unitrode UC1846 data sheet discussed above (item 8).

Item 22 is a portion of a databook including data sheets regarding various Siemens 9, 14, 16, 18 and 24 pin

integrated circuits for use in implementing the control functions of switched mode power supply circuits and other circuits. Block diagrams of the integrated circuits are shown on pp. 274, 287, 299, 310 and 321.

Conclusion

None of the above documents discloses or suggests, alone or in combination, applicant's invention as claimed in the present reissue application. Accordingly, prompt allowance is respectfully requested.

Respectfully submitted,



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